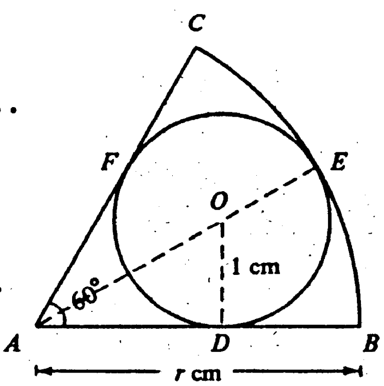
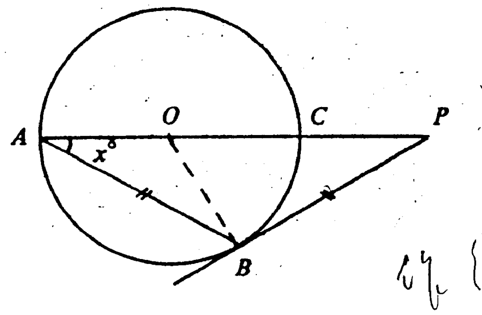
SOLUTION	MARKS	REMARKS
1. (a) $x^2 - 2x + 1 = (x-1)^2$	2A	or $(x-1)(x-1)$
(b) $x^2 - 2x + 1 - 4y^2 = (x-1)^2 - 4y^2$	1M	for $(\quad)^2 - 4y^2$
$= (x - 1 - 2y)(x - 1 + 2y)$	1M+1A	1M for diff. of 2 sq's. No marks for $x^2-4y^2=(x-2y)(x+2y)$
$= (x - 2y - 1)(x + 2y - 1)$	5	
或 $(x-1-4y)(x-1+4y)$ 得 1M		
2. Let $f(x) = 2x^3 + ax^2 + bx - 2$		
Putting $x = 2$,		
$f(2) = 4a + 2b + 14$ 不适当代入 (1p-1)	1A	
As $x - 2$ divides $f(x)$, $4a + 2b + 14 = 0$.	1M	for $f(2) = 0$ or $f(-1) = 0$
Similarly		
$f(-1) = a - b - 4$ $= 0$	1A	
Solving the equations, $6a + 6 = 0$		
$a = -1$, $b = -5$	1A+1A 5	
(Syll A)		
3. (a) $\sqrt{\dfrac{3^{5k+2}}{27^k}} = \sqrt{\dfrac{3^{5k+2}}{(3^3)^k}}$	1A	
$= 3^{k+1}$	1A	
(b) $\dfrac{\log a^3b^2 - \log ab^2}{\log \sqrt{a}} = \dfrac{\log \dfrac{a^3b^2}{ab^2}}{\log \sqrt{a}}$	1A	or $= \dfrac{\log a^3 + \log b^2 - \log a - \log b^2}{\log \sqrt{a}}$ 1A
$= \dfrac{\log a^2}{\log \sqrt{a}}$		$= \dfrac{3\log a - \log a}{\frac{1}{2}\log a}$ 1A
$= \dfrac{2\log a}{\frac{1}{2}\log a}$	1A	
$= 4$	1A 5	
(Syll B)		
3. $3^{2x} + 3^x - 2 = 0$		
$(3^x)^2 + 3^x - 2 = 0$	1M	$(3^x)^2$
$(3^x - 1)(3^x + 2) = 0$	1A	
$3^x = 1$ or $3^x = -2$	1A	)
(Rejecting $3^x = -2$)	1A	)Accept $3^x = 1$)
$x = 0$	1A 5	

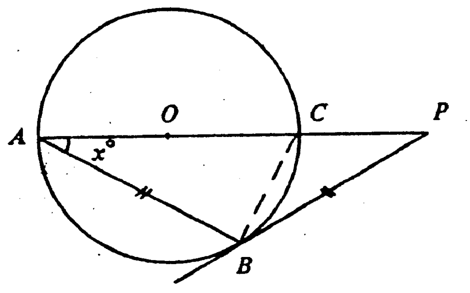
SOLUTION	MARKS	REMARKS
4. $\sin^2\theta = \frac{3}{2}\cos\theta$		
$1 - \cos^2\theta = \frac{3}{2}\cos\theta$	1A	
$2\cos^2\theta + 3\cos\theta - 2 = 0$		
$(2\cos\theta - 1)(\cos\theta + 2) = 0$	1A	
$2\cos\theta = 1$ or $\cos\theta = -2$	1A	)
		) Accept $2\cos\theta = 1$
Rejecting $\cos\theta = -2$, we have	1A	)
$\cos\theta = \frac{1}{2}$		
$\theta = 60°$ or $300°$ (or $\frac{\pi}{3}$, $\frac{5\pi}{3}$)	1A+1A	-1 for each extraneous solution
	6	
5. $kx^2 - 4x + 2k = 0$ $\alpha^2+\beta^2 = (-\frac{4}{k})^2 - 2(2)$		
4 $\alpha + \beta = \frac{4}{k}$) ; $\alpha\beta = 2$) .... $= \frac{16-4k^2}{k}$	1A	
(a) $\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$ (b) $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}$	1A	
$= (\frac{4}{k})^2 - (2)(2)$ $= \frac{8-2k^2}{k^2}$ ×	1M	
$= \frac{16}{k^2} - 4$	1A	or $\frac{16-4k^2}{k^2}$
(b) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{\alpha^2 + \beta^2}{\alpha\beta}$ $\frac{\alpha}{\beta}+\frac{\beta}{\alpha} = \frac{\alpha+\beta}{\alpha\beta} = \frac{\frac{4}{k}}{2} = \frac{2}{k}$ 1M		or equivalent.
$= (\frac{16}{k^2} - 4)\cdot\frac{1}{2}$	1M	
$= \frac{8}{k^2} - 2$	1A	
	6	
6. By symmetry, $\angle BAE = 30°$	1A	
AS $OD \perp AB$,		
$\sin 30° = \frac{1}{AO}$	1A	
$\therefore AO = 2$	1A	
$AE = AO + OE$		
$= 2 + 1$	1M	
$= 3$	1A	
$AB = AE$		
$\therefore r = 3$	1A	
	6	



SOLUTION	MARKS	REMARKS

7.



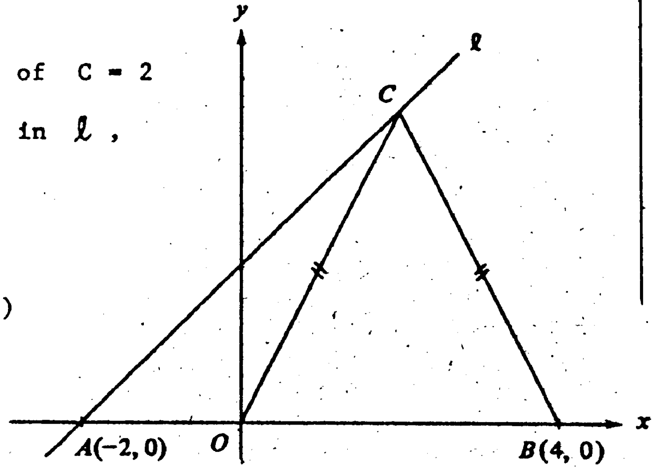


作線 1分

SOLUTION	MARKS	REMARKS
		Alternatively:
Join OB.	1A	Join BC.
As OA and OB are radii of the same circle, $\angle OBA = \angle PAB = x°$	1A	As PB is a tangent, $\angle CBP = \angle PAB = x°$.
Since PB is a tangent, $\angle OBP = 90°$	1A	Since AC is a diameter, $\angle ABC = 90°$ etc.
Given that BA = BP, $\angle BPA = \angle PAB = x°$	1A	
$x + x + x + 90 = 180$	1A	
$3x = 90$ $x = 30$	1A	
	6	

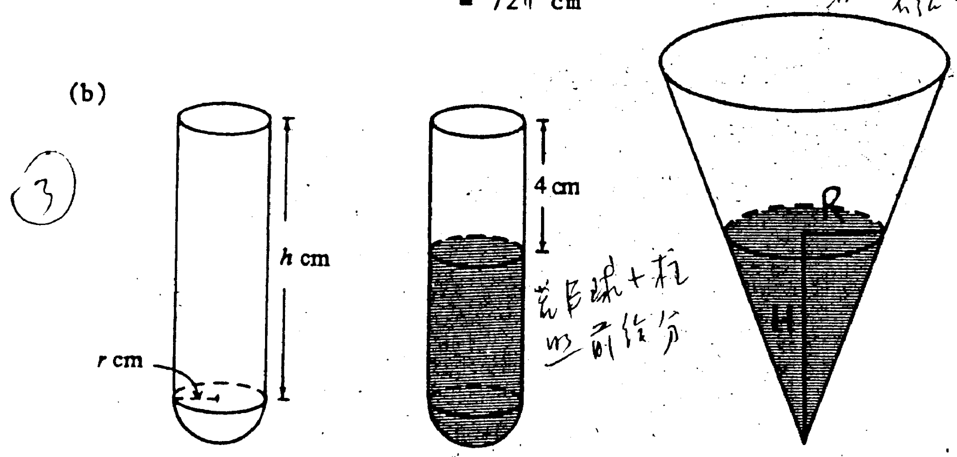
三角形有三x，形卻只有二x，不正確

只有 $3x = 90$, $x = 30$ 得2分

SOLUTION	MARKS	REMARKS
8. (a) Equation of ℓ is $y - 0 = (1)[x - (-2)]$	1A	
(2) i.e. $y = x + 2$ (or $x - y + 2 = 0$)	1A	
	2	
(b) As CO = CB, C lies on the perpendicular bisector of OB.	1M	Alternatively:
(3)		Let C = (x, y)
x-coordinate of C = 2	1A	$\sqrt{x^2+y^2} = \sqrt{(x-4)^2+y^2}$ 1M
直接寫出 C(2,) 1分		$8x = 16$
Substituting in ℓ,		$x = 2$ 1A
$y = 2 + 2$		
$= 4$	1A	
$\therefore$ C = (2, 4)		
	3	
(c) Let the equation of the circle be		Alternatively:
(4) $x^2 + y^2 + ax + by + c = 0$.	設方程加1點	The centre of the circle lies on the perpendicular bisector of OB (or OC, BC) 1M
Substituting (x, y) = (0, 0) or (4, 0) or (2, 4),	1M	
$c = 0$	1A	Let it be (2, y)
$16 + 4a = 0$ $4 + 16 + 2a + 4b = 0$ Method $(x-h)^2+(y-k)^2=r^2$ 設1點 — 1M. centre 1A+1A radius 1A eq. 1A		$(2-0)^2 + (y-0)^2$ $= (2-2)^2 + (y-4)^2$ $y = 3/2$ The centre is $(2, \frac{3}{2})$ 1A
$a = -4$ $b = -3$	1A 1A	Radius of circle $= \sqrt{4 + \frac{9}{4}} = \frac{5}{2}$ 1A
$\therefore$ the equation of the circle is		$\therefore$ eqn. of circle is
$x^2 + y^2 - 4x - 3y = 0$.		$(x-2)^2+(y-\frac{3}{2})^2 = \frac{25}{4}$ 1A or $x^2+y^2-4x-3y = 0$
	4	
(d) Substituting $y = x + 2$ in the equation of the circle,		
(3) $x^2 + (x + 2)^2 - 4x - 3(x + 2) = 0$	1M	
$2x^2 - 3x - 2 = 0$		
$(2x + 1)(x - 2) = 0$		
$x = 2$ or $-\frac{1}{2}$ 若只寫一點 仍給足分	1A	
Putting $x = -\frac{1}{2}$, $y = \frac{3}{2}$	1A	
$\therefore$ D = $(-\frac{1}{2}, \frac{3}{2})$ 若漏寫 C 點坐標 不給此 1A		
	3	

SOLUTION	MARKS	REMARKS
9. (a) (i) Capacity of hemispherical part		
$= (\frac{1}{2})(\frac{4}{3})\pi r^3$ 若能寫出有 r^3之方根 則可得 1M.		
(3)+(3) $= (\frac{1}{6})(108\pi)$	1M+1A	1M for setting up eqn in r^3. 1A for correct eqn.
$r^3 = 27$		
$r = 3$	1A	
Capacity of cylindrical part		若寫 $r = ..$ cm 是畫蛇足
$= \pi r^2 h$		
$= 9\pi h$ 若 r 有錯, 仍給此 1M	1M	
$9\pi h = (\frac{5}{6})(108\pi)$	1A	
$h = 10$	1A	
(ii) Volume of space $= \pi(3^2)(4)$ 108π − 1M		**Alternatively:**
(3) Volume of water $= 108\pi - (\pi)(3^2)(4)$ 若 r 有錯 1M	1M+1M	Volume $= \pi(3)^2(10-4) + \frac{108\pi}{6}$ ... 1M+1M
$= 72\pi\ cm^3$ 若不以π表示 不給	1A	$= 72\pi\ cm^3$ 1A
	9	

(b) (3)

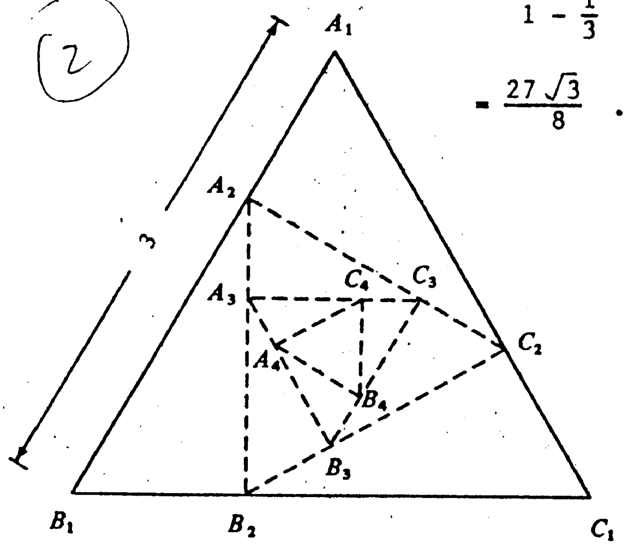


若只求 h+柱 的前給分

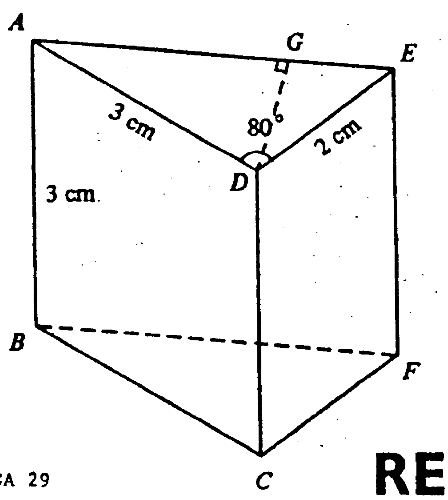
SOLUTION	MARKS	REMARKS
Let radius and depth of water be R and H .		
$\frac{1}{3}\pi R^2 H = 72\pi$ 若上有錯 給此 1M分	1M	
$R^2 H = 216$		
Capacity of vessel $= \frac{1}{3}\pi(2R)^2(2H)$	1M	
$= \frac{8}{3}\pi R^2 H$		
$= \frac{8}{3}\pi \cdot (216)$		可不給此分
$= 576\pi\ cm^3$	1A	−1 if unit not given
	3	

Alternatively:		
Since height of vessel = 2 X height of water		
Capacity of vessel $= 2^3 \times 72\pi$	2M	
$= 576\pi\ cm^3$	1A	−1 if unit not given
	3	

SOLUTION	MARKS	REMARKS
10. (a) Since the triangle is equilateral, $\angle A_1 = 60°$,		
(2) $T_1 = \frac{1}{2}(3)(3)(\sin 60°)$	1M	
$= \frac{9\sqrt{3}}{4}$	1A 2	
(b) (i) Since $A_2B_1 = 2$, $B_1B_2 = 1$ and $\angle B_1 = 60°$,		**Alternatively:** By cosine rule,
(2) $\angle B_1B_2A_2 = 90°$	1M	$(A_2B_2)^2$
$\therefore A_2B_2 = \sqrt{3}$	1A	$= 2^2+1^2-2(2)(1)\cos 60°$ $= 3$ $\therefore A_2B_2 = \sqrt{3}$
(ii) $\Delta A_2B_2C_2$ and $\Delta A_1B_1C_1$ are similar. The ratio of their sides is $\sqrt{3} : 3$. (2)		
$\therefore T_2 = \frac{9\sqrt{3}}{4}\left(\frac{\sqrt{3}}{3}\right)^2$	1M	
$= \frac{3\sqrt{3}}{4}$ 接受 $\frac{\sqrt{27}}{4}$	1A 4	
(c) (i) The common ratio $= \frac{1}{3}$ (1M, 若以小數表之 不扣分)	1M	
(ii) $T_n = \frac{9\sqrt{3}}{4}\left(\frac{1}{3}\right)^{n-1}$ 欠此括號 pp-1	1M	
(4) (iii) $T_1 + T_2 + \ldots + T_n = \frac{9\sqrt{3}}{4} \cdot \frac{1-(\frac{1}{3})^n}{1-\frac{1}{3}}$	1M	
$= \frac{27\sqrt{3}(1-\frac{1}{3^n})}{8}$	1A	
(iv) The sum to infinity $= \frac{\frac{9\sqrt{3}}{4}}{1-\frac{1}{3}}$ 只公式,不給M分	1M	
(2) $= \frac{27\sqrt{3}}{8}$	1A 6	



SOLUTION	MARKS	REMARKS
11. (a) Consider Δ ADE . By the cosine rule		
(3) $AE^2 = AD^2 + DE^2 - 2AD \cdot DE \cos \angle ADE$ 要适当表示 △ADE 边	1M	correct use of formula
$= 3^2 + 2^2 - 12\cos 80^\circ \ (= 10.91622)$	1A	
$AE = 3.304$ cm (correct to 3 d.p.)	1A / 3	
(b) Consider Δ ADE again. By the sine rule,		
(3) $\frac{DE}{\sin\angle DAE} = \frac{AE}{\sin\angle ADE}$ .... 使用公式时会(a)	2M	or cos rule
$\sin\angle DAE = \frac{DE\ \sin A\hat{D}E}{AE}$		
$\left(= \frac{1.9696}{3.304} = 0.59613 \right)$		
$\angle DAE = 36.593^\circ$ (correct to 3 d.p.) 以分数表示，不给此1A分	1A / 3	Accept 36.593-36.594
(c) (2) $DG = AD \sin D\hat{A}E$	1M	or $\sin D\hat{A}E = \frac{DG}{AD}$
$(= 3\sin 36.593^\circ)$ 不须以cm表示		
$(= (3)(0.59613))$		
$= 1.788$ cm (correct to 3 d.p.)	1A / 2	
(d) (2) $BD^2 = AB^2 + AD^2$	1M	
$BD = \sqrt{18}$		
$= 4.243$ cm (correct to 3 d.p.)	1A / 2	
(e) (2) $\sin D\hat{B}G = \frac{DG}{BD}$	1M	
$\left(= \frac{1.788}{4.243} = 0.4214 \right)$		
$\therefore \angle DBG = 24.923^\circ$ (correct to 3 d.p.)	1A / 2	Accept 24.920-24.940



SOLUTION	MARKS	REMARKS
12. (a) Given that $x \geqslant 0$		
$y \geqslant 0$		
$4000x + 6000y \geqslant 24\,000$		
Considering Products B and C ,		
2 $\underline{20\,000x + 5000y \geqslant 60\,000}$	1A	Withhold 1A if '=' missing
$\underline{6000x + 3000y \geqslant 24\,000}$	1A	
	2	
(b) The constraints in (a) can be written as		
6 $x \geqslant 0$ $y \geqslant 0$ $2x + 3y \geqslant 12$ $4x + y \geqslant 12$ $2x + y \geqslant 8$ 直线部分 用虚线,不接受 但不当作 region		
The lines corresponding to the last 3 inequalities are shown on the graph paper.	1A+1A +1A	±1 unit at x,y axes
Shading the correct region. 不适当的 shading 可扣 (PP-1)	3A	-1 if shading not complete. -2 if only arrows used
	6	
(c) Cost of materials used = $4000x + 3000y$ (dollars)	1A	
Drawing the line $4000x + 3000y = 0$ (or equivalent) (~~要求 slope 要正确~~) 不需要太准确)	1M	Candidates may also test all vertices of given region.
The cost is least when $x = 3$, $y = 2$ 可不考虑	1A	Awarded only if region correct
and the least cost is 18 000 (dollars)	1A	Point / Cost: (6,0) 24 000 (3,2) 18 000 (2,4) 20 000 (0,12) 36 000 要全代入
	4	

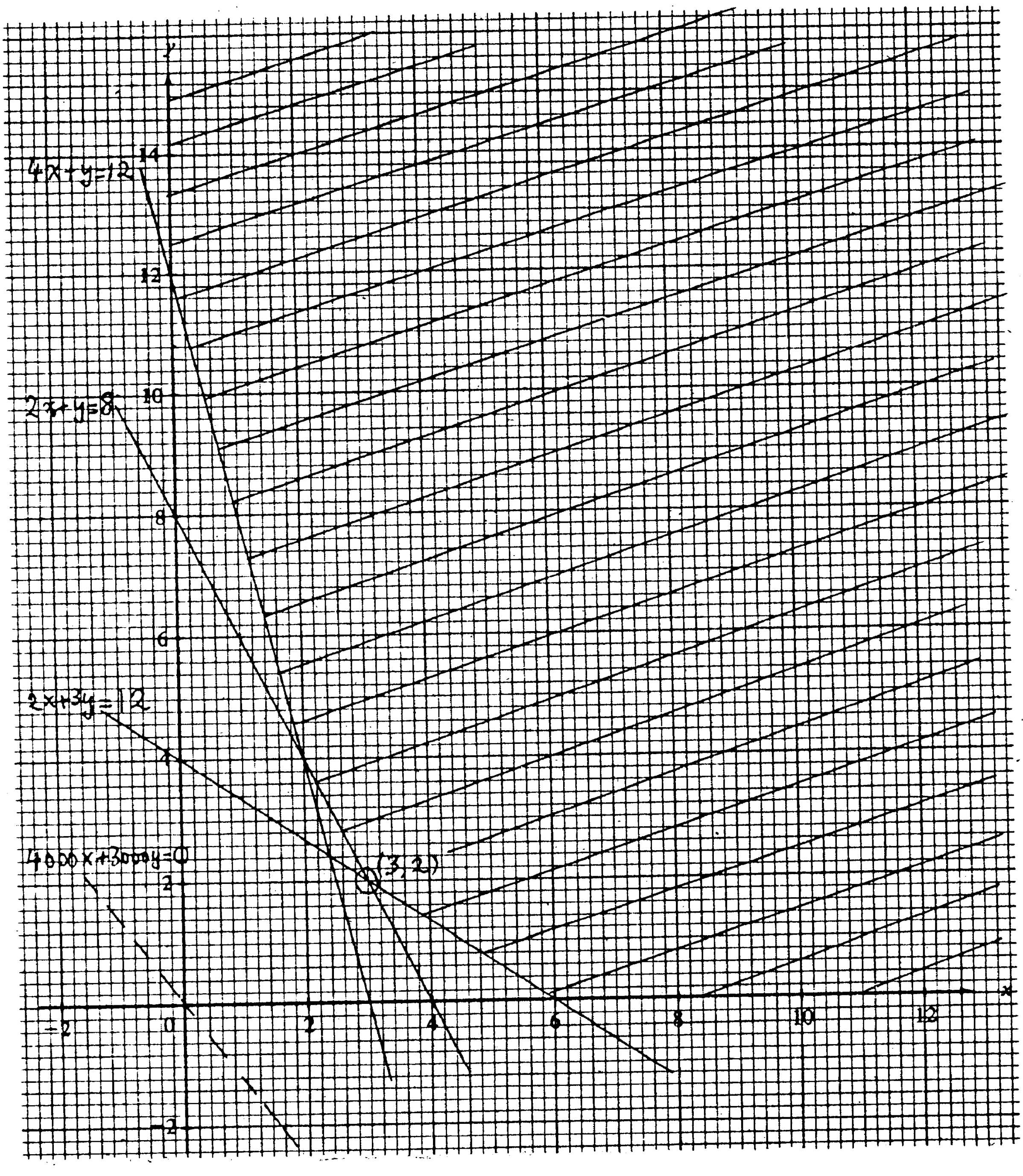
不 test 但只述 by testing 不给 1M 分
或 Test 不全, 也不给 1M.

若 shading 相反部份(错的) 扣 (PP-1)

只写值, 不扣分

有 1A
但必须 (checking 点全对)

12.


y
14
12
10
8
6
4
2
-2
0
2
4
6
8
10
12
x
4x+y=12
2x+y=8
2x+3y=12
4000x+3000y=0
(3,2)

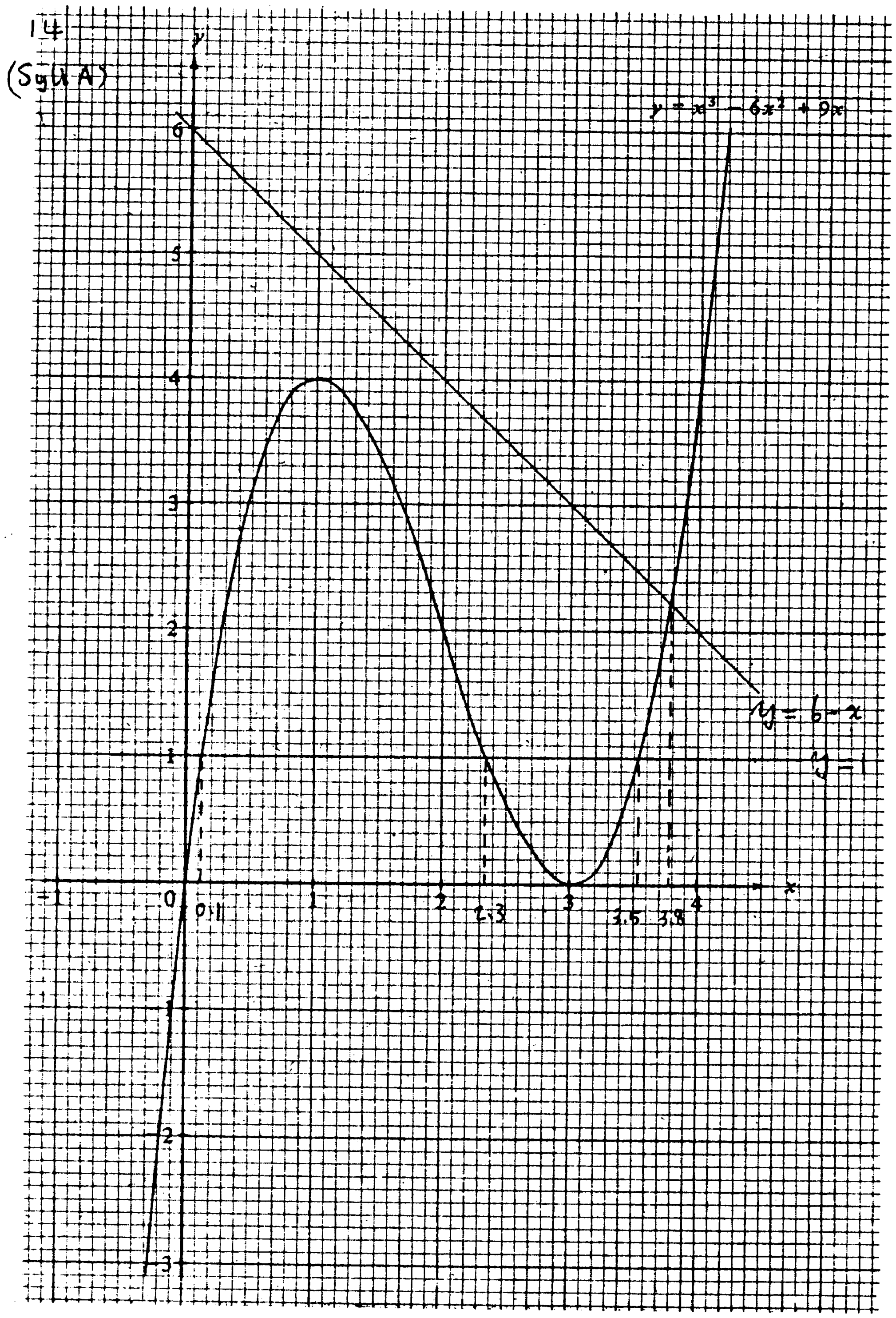
SOLUTION	MARKS	REMARKS
13. (a) The probability that the black ball is not drawn $= \frac{5}{6}$ (or $1 - \frac{1}{6} = \frac{5}{6}$)	2A	Any value roundable to 0.83. P.P. if only answer is given. However, accept P = 5/6.
②	2	
(b) The probability that the black ball is drawn from P to Q in the 1st draw $= \frac{1}{6}$	1A	
④ After that, the probability that the black ball is not drawn from Q to R in the 2nd draw $= \frac{4}{5}$	1A	
∴ the probability that the black ball is in Q $= \frac{1}{6} \times \frac{4}{5}$ $= \frac{2}{15}$ $\left(= \frac{4}{30}\right)$ $\frac{1}{6} + \frac{4}{5}$ 1+1 $\frac{1}{6} \times \frac{4}{5} \times$ — 1+1	2A	Alternatively: $1 - \frac{5}{6} - \frac{2}{15}$ 1M 2M
	4	
(c) The probability that the black ball is drawn from Q to R $= \frac{1}{5}$	1A	
③ ∴ the probability that the black ball is in R $= \frac{1}{6} \times \frac{1}{5}$	1A	
$= \frac{1}{30}$ $= 0.03$ $\frac{1}{6}$ 1A $\frac{1}{5}$ 1A	1A	
	3	
(d) The probability that a white ball is drawn from P to Q in the 1st draw $= \frac{3}{6}$ $\left(= \frac{1}{2}\right)$	1A	若不表示所求概率者則 (PP-1)
③ After that, the probability that a white ball is drawn from Q to R in the 2nd draw $= \frac{1}{5}$	1A	
∴ the proabability that all balls in R are white $= \frac{1}{2} \times \frac{1}{5}$ 1+1 $1 - \left(\frac{3}{6} \times \frac{5}{5} + \frac{3}{6} \times \frac{4}{5}\right)$ $= \frac{1}{10}$ .... 0.1 容許 $\frac{3}{30}$	1A	若僅表達錯誤 亦有正確答案 給全部分數
	3	

SOLUTION	MARKS	REMARKS
(Syllabus A)		
14. (a) (i) $x^3 - 6x^2 + 9x - 1 = 0$		
3 $x^3 - 6x^2 + 9x = 1$	1M	
Drawing the line $y = 1$, the roots of the given equation were found to be 0.1, 2.3 and 3.5 (correct to 1 d.p.).	1A+1A	1 mark for 2 correct answers
首二答案 1分 第三 ·· 1分 不給一位小數 不給分		
(ii) $x^3 - 6x^2 + 10x - 6 = 0$		
3 $x^3 - 6x^2 + 9x = 6 - x$	1M	for correct L.S.
Drawing the line $y = 6 - x$, the root was found to be 3.8 (correct to 1 d.p.)	1A 1A 6	for graph, ±1 unit at (3,3), (4,2)
答案 若作 3.7 不給 1A		

(b) 3

x	$x^3 - 6x^2 + 10x - 6$
3.76	$-$ ($= -0.068$)
3.77	$+$ ($= 0.005$)
3.765	$-$ ($= -0.031$)

SOLUTION	MARKS	REMARKS
– change signs 給 1M.		
3.76, 3.77)	1M	Change of sign, $-$ve for 3.765–3.769
3.77, 3.765) ...	1A	May use graphical method
3.765 – 3.769 之範圍		
$\therefore x = 3.77$ (correct to 2 d.p.)	1A 3	
(c) Consider $x^3 - 6x^2 + 9x = k$ ← 可不寫	1M	
From the graph, if $0 < k < 4$,	1A+1A	-1 for '$\leq$' if otherwise correct.
the line $y = k$ meets the curve $y = x^3 - 6x^2 + 9x$ at three distinct points.		may omit
$\therefore x^3 - 6x^2 + 9x - k = 0$ has three distinct roots.	3	



注
右1/0要見示
記下與此圖考生分數

SOLUTION	MARKS	REMARKS
(Syllabus B)		
14. (a) Since $y \propto x$ and $z \propto \frac{1}{x}$, $y = k_1x$ and $z = \frac{k_2}{x}$	1A+1A	Accept $y = kx$, $z = \frac{k}{x}$
(for some real k_1, k_2).		
$\therefore\ p = k_1x + \frac{k_2}{x}$		
Putting $x = 2$, $p = 7$, (or $x = 3$, $p = 8$)	1M	
$7 = 2k_1 + \frac{k_2}{2}$	1A	
i.e. $4k_1 + k_2 = 14$		
Putting $x = 3$, $p = 8$.		
$8 = 3k_1 + \frac{k_2}{3}$	1A	
or $9k_1 + k_2 = 24$		
Solving these two equations,		
$5k_1 = 10$		
$k_1 = 2$	1A	
$k_2 = 6$	1A	
$\therefore\ p = 2x + \frac{6}{x}$		
When $x = 4$, $p = 2(4) + \frac{6}{4}$		
$= \frac{19}{2}$	1A	
	8	
(b) $2x + \frac{6}{x} < 13$	1M	
$2x^2 - 13x + 6 < 0$ (as $x > 0$)	1A	
$(2x - 1)(x - 6) < 0$		
$\therefore\ \frac{1}{2} < x < 6$	2A	-1 for '$\leq$'
	4	